

IXODID TICKS OF MAHARASHTRA STATE, INDIA

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FAUNA TICKS INDIA	ABSTRACT : A survey of ixodid ticks in Maharashtra, India, was undertaken during 1976 to 1978. The tick collection included specimens from domestic animals, birds, small mammals and from cattle-sheds. A total of 21 species of ixodid species was collected, which raises the total number of species known in Maharashtra to 28. A definite pattern in the distribution of certain species has emerged from these studies. Most of the species recorded showed some degree of host and site preferences. Mass breeding of <i>Hyalomma anatolicum anatolicum</i> and <i>Haemaphysalis bispinosa</i> was observed inside the cattle sheds.
FAUNE TIQUES INDE	RÉSUMÉ : Un examen des tiques du Maharashtra, en Inde, a été entrepris de 1976 à 1978. La récolte des tiques comprenait des spécimens provenant d'animaux domestiques, d'oiseaux, de petits mammifères et du bétail. Un total de 21 espèces d'ixodides a été récolté, ce qui, y compris les relevés précédents, élève à 28 le nombre total des espèces récoltées au Maharashtra. Un modèle défini de la distribution de certaines espèces est ressorti de ces études. La plupart des espèces présentes ont montré un certain degré de prédilections pour l'hôte et pour le site. Une progéniture nombreuse de <i>Hyalomma anatolicum anatolicum</i> et de <i>Haemaphysalis bispinosa</i> a été observée au sein du bétail.

INTRODUCTION

Ticks surpass all other arthropods in the number of diseases they transmit to man and animals. Our present knowledge on the ticks of Maharashtra State, India is based on sporadic records by SHARIF (1928), SEN (1938), MISHRA, DHANDA & KULKARNI (1977) studied the ectoparasites of small mammals of Western Ghats near Poona. No systematic survey of ticks in various ecological conditions of Maharashtra has been reported so far. The present report is based mainly on the ticks collected from different animals during a study undertaken in the State between 1976 and 1978. Earlier collections commencing from 1962, available at the National Institute of Virology (NIV), were also studied.

MATERIAL AND METHODS

Description of the area :

Maharashtra State lies between latitude 15°44' N and 22° N and longitude 72°45 E and 81° E. The state can be broadly divided into three natural regions : (1) the Deccan plateau which lies towards the east of Sahyadri and extends from Satpura range on the northern border up to the south-eastern border of the state ; (2) the Sahyadri or the Western Ghats, along with its spurs extending eastwards into the plateau ; (3) the Konkan area or coastal belt, consisting of a narrow stretch of land lying between the Western Ghats and the Arabian Sea.

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Methods :

Six districts coming under the above three natural divisions were selected for survey. The districts included Pune, Ahmednagar, Aurangabad, Satara, Raidagh and Ratnagiri. The methods of collections of ticks and their vertebrate hosts have been described elsewhere (GEEVARGHESE & DHANDA, 1986).

RESULTS AND DISCUSSION

During the study period from 1976 to 1978, a total of 5,138 domestic animals, including 1,438 cattle, 900 buffaloes, 1,065 sheep, 1,735 goats, 521 small mammals and 83 birds were searched. A total of 14,227 adults, 6,533 nymphs and 1,569 larvae belonging to 21 species of ixodid ticks were collected. In an earlier survey of some parts of Nagpur, SRIVASTAVA & WATTAL (1973) had recorded 10 species of ixodid ticks. MISHRA, DHANDA & KULKARNI (1977) recorded 11 species, mostly immature stages, from Western Ghats in Poona District. During the present study, a total of 21 species of ixodid species was collected, raising the total number of species known in Maharashtra to 28 (Table 1). Three species, viz. *Haemaphysalis centropi*, *H. cuspidata* and *H. minuta*, are reported for the first time from the state.

Infestation pattern

Cattle :

Out of 1,438 cattle searched, 1,086 (75.52 %) were positive for ixodid ticks. In all, 12 ixodid species, comprising 8,479 adults, 4,477 nymphs and 51 larvae, were collected. The number of ticks collected per host is given in Table 2. The four important species collected from cattle, in order of abundance, are *Hyalomma a. anatolicum*, *Boophilus microplus*, *Haemaphysalis bispinosa* and *Rhipicephalus haemaphysaloides*. these four species constituted 96.57 % of the total collection.

Buffalo :

In all 900 buffaloes were searched, out of which 384 (42.67 %) were positive for ticks. A total of 8

1	* <i>Aponoma gervaisi</i> Warbuton, 1970
2	<i>Boophilus microplus</i> Canestrini, 1877 Sharif
3	<i>Haemaphysalis bispinosa</i> Warburton and Nuttall, 1909
4	<i>H. centropi</i> Kohls, 1949
5	<i>H. cuspidata</i> Warburton, 1910
6	<i>H. howletti</i> Warburton, 1913
7	<i>H. indica</i> Warburton, 1910
8	<i>H. intermedia</i> Neumann, 1908
9	<i>H. minuta</i> Kohls, 1950
10	<i>H. paraturturis</i> Hoogstraal, Trapido and Rebello, 1963
11	<i>H. silvafelis</i> Hoogstraal and Trapido, 1963
12	<i>H. spinigera</i> Neumann, 1897
13	<i>Hyalomma anatolicum anatolicum</i> Koch, 1844
14	<i>H. marginatum isaaci</i> Sharif, 1928
15	* <i>H. marginatum turanicum</i> Pomerantzev, 1946
16	<i>H. dromedarii</i> Koch, 1844
17	<i>H. detritum</i> Schulze, 1919
18	<i>H. hussaini</i> Sharif, 1928
19	<i>H. brevipunctata</i> Sharif, 1928
20	<i>H. kumari</i> Sharif, 1929
21	<i>Ixodes ceylonensis</i> Neumann, 1906
22	<i>Nosomma monstrosus</i> Nuttall and Warburton, 1908
23	<i>Rhipicephalus haemaphysaloides</i> Supino, 1897
24	<i>R. turanicus</i> Pomerantzev & Matkashvili, 1940
25	<i>R. sanguineus</i> Latreille, 1806
26	<i>R. ramachandrai</i> Dhanda, 1966
27	* <i>Dermacentor auratus</i> Supino, 1897
28	* <i>Amblyomma javanense</i> (Supino, 1897)

* Not collected during present study, but available in NIV collection.

TABLE 1 : Ixodid tick species recorded from Maharashtra.

species of ticks including 1,883 adults, 1,107 nymphs and 94 larvae was collected (Table 2). The four major species collected, in order of abundance, are *Hy. a. anatolicum*, *B. microplus*, *H. bispinosa* and *R. haemaphysaloides*, which together contributed 87.25 % of the total collection.

Sheep :

In total, 1,065 sheep were searched, out of which 574 (53.90 %) were positive for ticks. In all, 8 species of ticks, consisting of 1,663 adults, 206 nymphs and 12 larvae were collected (Table 2). The four species in the order of their preponderance were *Haemaphysalis intermedia*, *H. bispinosa*, *Rhipicephalus haemaphysaloides* and *Hyalomma marginatum isaaci*. These four species formed 85.64 % of the total collection.

	Cattle			Buffalo			Sheep			Goat		
	L	N	A	L	N	A	L	N	A	L	N	A
<i>H. a. anatolicum</i>	47	3559	1980	71	824	640	10	122	79	0	136	9
<i>H. m. isaaci</i>	0	0	103	0	0	125	0	0	223	0	0	139
<i>H. hussaini</i>	0	0	148	0	0	97	0	0	46	0	0	256
<i>H. brevipunctata</i>	0	0	94	0	0	3	0	0	3	0	0	0
<i>H. kumari</i>	0	0	69	0	0	56	0	0	0	0	0	0
<i>H. bispinosa</i>	0	49	1286	0	39	203	2	69	382	0	6	217
<i>H. intermedia</i>	0	0	8	0	0	0	0	14	608	12	66	1030
<i>H. spinigerra</i>	0	0	19	0	0	3	0	0	0	0	0	0
<i>H. paraturturis</i>	0	0	2	0	0	0	0	0	0	0	0	8
<i>R. haemaphysaloides</i>	0	3	591	0	0	154	0	0	313	0	0	406
<i>N. monstrosus</i>	0	0	3	0	0	109	0	0	0	0	0	0
<i>B. microplus</i>	4	866	4176	23	244	493	0	1	9	0	9	32
Total	51	4477	8479	94	1107	1883	12	206	1663	12	217	2097

TABLE 2 : Ixodid ticks collected from domestic animals from Maharashtra, India. L = Larvae ; N = Nymphs ; A = Adults.

Goats :

In total, 1,785 goats were searched, out of which 628 (36.20 %) were positive. *H. intermedia*, *R. haemaphysaloides*, *Hy. hussaini* and *H. bispinosa* are the major species, which together constituted 85.42 % of the collection.

Small mammals :

In total, 521 small mammals belonging to 17 species were searched. Of these, 169 were positive for ticks. Except for a few instances where adults were collected, small mammals were only infested with immatures. A total of 15 tick species, belonging to 5 genera was collected (Table 3). The commonest species was *R. haemaphysaloides*, followed by *Hyalomma kumari* and *Haemaphysalis indica*. *Suncus murinus* and *Mus saxicola* were found with highest number of tick species. *Rhipicephalus ramachandrai* was only collected from *Tatera indica*, indicating its high host specificity. Among all the small mammals, *Lepus nigrincolis* was the only species infested with the immatures of *Hy. m. isaaci*.

Birds :

In total, 83 birds, belonging to 25 species, were examined for ticks. Out of these, only the crow-pheasant, the jungle-babbler and the yellow-eyed babbler, were found to be infested. *Haemaphysalis*

	Larvae	Nymphs	Adults	Host
<i>H. centropi</i>	3	30	8	C.p.
<i>H. howletti</i>	51	10	2	<i>B.b.</i> , <i>F.p.</i> , <i>M.s.</i> , <i>M.p.</i> , <i>R.r.r.</i> , <i>M.b.</i>
<i>H. cuspidata</i>	1	—	—	C.p.
<i>H. intermedia</i>	65	42	95	<i>B.i.</i> , <i>R.r.r.</i> , C.p.
<i>H. minuta</i>	—	2	—	J.b.
<i>H. indica</i>	30	30	—	<i>S.m.</i> , <i>G.e.</i> , <i>M.p.</i> , <i>R.b.</i> , <i>M.s.</i> , <i>R.r.r.</i> , <i>M.b.</i>
<i>H. paraturturis</i>	93	13	—	<i>S.m.</i> , <i>F.p.</i> , <i>G.e.</i> , <i>M.s.</i> , <i>M.p.</i> , <i>R.r.r.</i> , <i>Y.b.</i> , C.p.
<i>H. silvafelis</i>	—	4	—	<i>F.p.</i> , C.p.
<i>H. spinegera</i>	22	28	—	<i>R.b.</i> , <i>R.r.r.</i> , J.b., C.p.
<i>Hy. brevipunctata</i>	24	11	—	<i>G.e.</i> , <i>M.s.</i> , <i>R.r.r.</i> , <i>M.b.</i> C.p.
<i>Hy. hussaini</i>	26	1	—	<i>S.m.</i> , <i>M.s.</i> , <i>R.b.</i> , <i>R.r.r.</i>
<i>Hy. isaaci</i>	2	33	—	<i>L.n.</i> , C.p.
<i>Ixo. ceylonensis</i>	1	—	—	<i>R.s.</i>
<i>R. haemaphysaloides</i>	965	300	—	<i>G.e.</i> , <i>M.s.</i> , <i>M.p.</i> , <i>R.b.</i> , <i>R.r.r.</i> , <i>R.s.</i> , <i>T.i.</i> , <i>M.b.</i> , J.b., C.p.
<i>R. sanguineus</i>	1	—	—	<i>R.r.r.</i>
<i>R. ramachandrai</i>	14	4	—	<i>T.i.</i>
<i>N. monstrosus</i>	17	3	—	<i>S.m.</i> , <i>M.s.</i> , <i>M.b.</i>

TABLE 3 : Ixodid ticks collected from small mammals and birds in Maharashtra State, India. Host abbreviations : *B.b.* = *Bandicota bengalensis*; *B.i.* = *B. indica*; C.p. = Crow pheasant; *F.p.* = *Funambulus pennenti*; *G.e.* = *Golunda elleoti*; *J.b.* = *Jungle Babbler*; *L.n.* = *Lepus nigrincolis*; *M.b.* = *Mus booduga*; *M.p.* = *Mus platythrix*; *M.s.* = *Mus saxicola*; *R.b.* = *Rattus blanfordi*; *R.r.r.* = *R. rattus rufescens*; *R.s.* = *R. satarae*; *S.m.* = *Suncus murinus*; *T.i.* = *Tatera indica*; *Y. b.* = Yellow-eyed babbler.

intermedia and *Haemaphysalis paraturturis* were the two commonest species collected in good numbers. *H. spinigera*, which is incriminated as the vector of KFD, was also collected from crow-pheasants.

Distribution patterns

A definite pattern in the distribution of certain species has emerged from these collections. *Hy. a. anaticum* was mostly prevalent in the plateau region with a semi-arid climate and was absent, or present in negligible numbers, in the western Ghats and the coastal regions with heavy rainfall and an equitable climate. In contrast, *Hy. hussaini* was totally absent in the coastal region. Its place was taken by another closely related species, *Hy. kumari*. *Hy. brevipunctata* was observed to have a restricted distribution, and was collected in good numbers only in Palve village in the Plateau region. *Haemaphysalis spinigera* and *Nosomma monstrosus* were seen to be distributed mostly in western Ghats and coastal regions. Species like *R. haemaphysaloides* and *B. microplus* were common in all the regions.

Host preferences

Among the adult ticks recorded from domestic animals, *Rhipicephalus haemaphysaloides* was common on cattle, buffalo, sheep and goats. All other species showed some degree of host preference. Thus, *Nosomma monstrosus* were collected mainly from buffaloes, rarely from cattle and never from sheep or goats. There are also records of this species parasitizing wild boar (NIV unpublished data). *H. intermedia* were collected mostly from sheep and goats and rarely from cattle and buffaloes. Similarly, *Hy. a. anaticum*, *B. microplus*, *Hy. brevipunctata* and *Hy. kumari* showed a distinct preference for cattle and buffaloes. Among the immature stages, those of *R. haemaphysaloides* showed a wide range of host preferences. *N. monstrosus* parasitized mostly *Mus. spp.* whereas *Hy. m. isaaci* preferred *Lepus nigricollis*. *R. ramachandrai* was only collected from *Tatera indica*.

Site preferences

The study showed that, though majority of the species attached at different sites on the body of

their hosts, certain species showed site preferences. Adults of *Hy. isaaci* and *N. monstrosus* attached on the tail and the anal regions. Adults of *Hyalomma* ticks preferred mostly axil and inguinal regions, whereas those of *R. haemaphysaloides*, *H. bispinosa* and *H. intermedia*, in addition to the above sites, preferred ears, especially in the case of sheep and goats. Immature stages, in general, were concentrated more on the ears, dewlap and inguinal regions. Various factors contributing to the site preferences of ticks have been discussed elsewhere (Geevarghese & DHANDA, 1986).

Mass breeding of ticks inside the cattle shed

Two species, viz. *H. bispinosa* and *Hy. a. anaticum* were found to breed inside cattle sheds. All the stages of these ticks viz., eggs, larvae, nymphs and adults were found in the cracks and crevices of the walls, floor and the timber used for construction. Though infestation of *H. bispinosa* was observed in all the study areas, heavy breeding in cattle sheds was found mostly in the humid areas in the Western Ghats and Konkan regions. In contrast, the breeding of *Hy. a. anaticum* was mostly seen in the dry and hot region of the Plateau. Mass breeding of these two species of ticks in cattle sheds has been reported earlier by other workers (SERDYUKOVA, 1945; BHAT, 1971).

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REFERENCES

- BHAT (H. R.), 1971. — Localised mass breeding of *Haemaphysalis bispinosa* Neumann, 1897 (Acarina : Ixodidae) in Kyasanur Forest Disease area, Shimoga District, Mysore State, India. — J. Bombay Nat. Hist. Soc., **68** (2) : 485-489.
- GEEVARGHESE (G.) and DHANDA (V.), 1986 — The Indian *Hyalomma* ticks (Ixodoidea : Ixodidae). — Published by ICAR, New Delhi : 1-119.

- DHANDA (V.), 1964. — Description of immature stages of *Haemaphysalis howletti* (Ixodoidea : Ixodidae), and redescription of adults. — J. Parasitol., **50** (3) : 459-465.
- DHANDA (V.), 1966. — *Rhipicephalus ramachandrai* sp. n. (Acarina : Ixodidae) from the Indian gerbil, *Tatera indica* (Hardwicke, 1807) Rodentia, Muridae. — J. Parasitol., **52** (5) : 1025-1031.
- MISHRA (A. C.), DHANDA (V.) and KULKARNI (S. M.) 1977, — Ectoparasites of small mammals from Western Ghats of Poona District, Maharashtra. — J. Com. Dis., **9** (1) : 40-48.
- SEN (P.), 1938, — A check and host-list of Ixodoidea (ticks) occurring in India. — Indian Jour. Vet. Sci., **8** (2) : 133-147.
- SERDYUKOVA (G. V.), 1945. — An instance of local massive increase of *Hyalomma anatolicum anatolicum* Koch ticks in Tadzhikistan and what caused it (In Russian). — I. V. Tadzhik Fil. Akad Nauk SSSR, **6** : 60-63.
- SHARIF (M.), 1928, — A revision of the Indian Ixodidae with special reference to the collection in the Indian Museum. — Rec. Ind. Mus., **30** : 217-344.
- SRIVASTAVA (S. P.) and WATTAL (B. L.), 1973. — Studies on the distribution of ectoparasites and their vertebrate hosts in urban, semiurban (peripheral) and sylvatic zone of Nagpur city and neighbouring areas (Maharashtra, India). — Indian J. Ent., **35** (4) : 306-324.